

*Royal College of Physicians  
from the  
Author*

PRELIMINARY EDUCATION,

OR

THE GENERAL CULTURE REQUIRED BY THE  
STUDENT OF MEDICINE :

A DISCOURSE

DELIVERED BEFORE

THE HARVEIAN SOCIETY OF EDINBURGH,

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BY

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## PRELIMINARY MEDICAL EDUCATION.

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THE great man whose memory we meet to-day to celebrate left to his professional brethren this valuable advice, "Study and search out the secrets of nature by way of experiment, and, for the honour of the profession, continue mutually in love."

Aware how much social gatherings tend to remove the asperities which conflicting interests or differences of opinion too often generate, besides endowing the College of Physicians of London handsomely, in the fond hope of enabling its Fellows "to study and search out the secrets of nature," he bequeathed to it what was in those days considered a sum amply sufficient for the purpose, "that they might have a meeting and a collation once a month."

Tread we then in his steps, and as on this the evening of his natal day we encircle the festive board, and celebrate the circulation of the blood by the moderate circulation of the wine-cup, the emblem of union and harmony and peace, let it be the pledge that "all bitterness, and wrath, and anger, and clamour, and evil-speaking, shall be put away from us," not only here, but wherever we may be, and that, "for the honour of our profession, we shall continue mutually in love."

Nor let us neglect the other portion of this valuable advice; let us "study and search out the secrets of nature by way of experiment;" let us each in his own sphere, and according to his own opportunities, assist in building up the great temple of truth, assured of this, that there is no work which does not bring its own reward, and no labour, however humble, if carried out in a reverent and loving spirit, which will not do something to advance the great cause, the furtherance of which every votary of science professes to seek.

Startling as the discovery of Harvey must have been to his contemporaries, and calculated as it undoubtedly was to revolutionize all the physiological science of his day, we need only study the products of the great minds immediately preceding and contemporary with him, to see how for his, as for all other great discoveries, the minds of men had been gradually educating; that Sylvius, for example, had pointed out the existence of the valves of the veins, while Fabricius of Aquapendente (Harvey's teacher at Padua) had

shown that they are all turned towards the heart; reserving for Harvey only the glory of demonstrating that the blood moves in a different direction in the arteries and in the veins, and thus of being the discoverer of its circulation.

Let us for a moment consider what were the mental qualities which such a discovery implied, and from the record of Harvey's life endeavour to ascertain how they were acquired. In the first place, he must have possessed distinct and clear views of physical science, of the laws of hydrostatics, of the motions of fluids circulating in ramifying tubes, of the effect of the opening and closing of valves; in the second place, he must not only have carefully observed and noted the actual phenomena of the circulation as it is carried on in our own bodies, and in those of other living animals, but he must have performed many experiments in order to discover the truth which he afterwards promulgated. That this *was* his method, it is not left for us to conjecture, for in the preface to another of his works he tells us:—"In every science, be it what it will, a diligent observation is requisite, and sense itself must be frequently consulted. We must not rely upon other men's experience, but our own, without which no man is a proper disciple of any part of natural knowledge."

But mere observation and mere experiment could not alone have evolved the great truth which has immortalized the name of Harvey. An inductive philosopher, as all true philosophers must be, he pursued the method of his illustrious friend and patient Bacon before it had been promulgated; and possessing the powers of observation which enabled him to note and register his facts, and the power of invention which enabled him to contrive and perform his experiments, his was also a mind capable of generalization, which enabled him to evolve from those facts and those experiments the true theory of the circulation.

One other quality of the philosophic mind he also possessed in large measure. In him the philosophy of nature had not extinguished its poetry; and while minutely examining the fearful and wonderful structure of the body in which he dwelt, and, interpreting its mysteries, he was led, as many another has been to look from nature up to nature's God; or rather, beginning and ending all his scientific pursuits with humble faith and reverent adoration of the Almighty, he arrived by the argument from design at his great discovery. "I remember," says Boyle, "that when I asked our famous Harvey what were the things that induced him to think of a circulation of the blood, he answered me, that when he took notice that the valves in the veins of so many parts of the body were so placed that they gave a free passage to the blood towards the heart, but opposed the passage of the venal blood the contrary way, he was incited to imagine that so provident a cause as nature had not placed so many valves without design, and no design seemed more probable than that the blood should be



sent through the arteries, and return through the veins whose valves did not oppose its course that way."

Distinct knowledge of laws, careful observation of facts, patient trial of experiments, the union of these in a mind capable of generalization, and a humble and living faith in his great Creator, were the qualities which enabled Harvey to realize his grand conception. Is this genius? Not, if by genius we mean, as some do, an original gift which almost without training or cultivation enables men to arrive at great results. But if by genius we mean that state of mind in which its various powers are so ordered as to become with due cultivation and exercise most powerful, and yet most harmonious, then was his genius of the highest order.

He was a ripe and finished scholar; educated in classical knowledge at the Grammar School of Canterbury, he perfected his acquaintance with ancient lore, and studied philosophy at Cambridge; then, at the age of nineteen, he commenced his medical studies at Padua. He subsequently returned to his native country, became physician to St Bartholomew's Hospital, and in succession to James I. and Charles I., the latter of whom he accompanied twice to Scotland. Of the advantages he thus enjoyed he thoroughly availed himself, and we are not surprised to find that so accomplished and learned a physician associated on equal terms with Bacon and Hobbes, Dryden, Cowley, and Boyle, and the other distinguished philosophers and poets, who were the ornaments of that brilliant court with which he was so long connected.

And what the study of nature and of scientific medicine, as founded on that study, required of her votaries in his day, she still imperatively demands in ours.

By much previous training, by much earnest study, by much laborious preparation, can the mind alone be disciplined fittingly and reverently to search into the arcana of nature. How shall this fitting state of mind be best produced? or, in other words, In what does true education consist? is becoming more and more agitated in our day; and I cannot think it a task unbecoming the commemoration of the memory of one who was so distinguished an example of what all true physicians should seek to be, if I devote a little time to consider the objects and aims of the preliminary education of the physician, how it should be directed, and what it should embrace.

"Perhaps there is no science," says Professor Vogel, "which requires so penetrating an intellect, so much talent and genius, so much acuteness and memory, as the science of Medicine. For the full attainment of its ultimate and proper object, it requires also indispensably the possession of stability of judgment, rapidity of decision, and immoveable firmness and presence of mind." The studies which the range of professional inquiry embraces are also varied and intricate, and to be properly mastered require that the mind shall be duly disciplined for their reception. It is for this

object that a liberal education is so essential a preliminary to medical study.

If there be any truth in this, can we wonder at the ignorance of many of our practitioners, and the unphilosophical and pernicious character of much of the practice of our art, when the state of mind of those who enter upon its study is considered. To comprehend the very earliest subjects which his professional course enjoins, the student must bring to their study a disciplined mind. Intelligently to profit by the instructions of his teacher, he must see for himself with philosophic eye; he must discriminate truth from error,—a process which requires a clear judgment and an ability to reason; he must understand the principles of practical logic, and be trained in the use of the inductive philosophy. Without this he cannot intelligently master the most simple and elementary of his professional studies, and the pursuing of them without these qualifications will not only be a waste of time, but will have the effect of rendering him a careless and inefficient student, and of preventing him from profiting by the teaching even of the ablest instructor.

Contrast with what I have shown to be a necessary pre-requisite to the philosophic study of Medicine, the actual mental state in which the great mass of students enter on their professional studies. Their minds are not only generally unfurnished, but often actually unformed. They are utterly unable to group together or arrange the facts with which their teachers supply them: they have never been trained to follow a process of reasoning, to comprehend analogies, to compare the like and contrast the unlike in different bodies, and so to name, sort, and classify the materials of which their sensible and conscious experience is composed. If, then, they have never been taught the uses of abstraction and generalization, if they have never exercised their judgments so as to ascertain the mutual relations of things, then their reasoning powers must have lain dormant, and in this state they are expected to become fitting investigators of philosophic truth!! Not only is a mind in such a state utterly unable to grapple with the subjects that will be presented to it, but the development of its intellectual faculties will be arrested, its whole growth stunted, and its vigour weakened by the attempt. To bring to the task of mastering science minds undisciplined in that knowledge which is the foundation of all sciences, is like attempting to gain information by travelling in a foreign land, with the language, the currency, and the mode of life of which we are utterly unacquainted.

The Medical Council has done great service by compelling an examination in what is called preliminary education to be undergone before medical studies are entered upon; but they must go a great deal further: they must prescribe more clearly what these studies are to be, and they must exercise the same control over, and take the same care to improve the examination in them, as they have done in regard to those examinations which ascertain the amount of professional acquirement.



There are two theories of education which have found supporters at the present day, and very much according as one or the other is adopted are the views taken of what education should be. The one regards education exclusively as a means for disciplining the understanding; cares little for the subject; attaches great importance to the form. The knowledge is nothing; the mental exercise spent in acquiring it is everything.

The opposite theory we shall perhaps best state in the language of Mr Lowe. "And first," said this gentleman in his Edinburgh address, "I will endeavour to explain to you what I conceive to be the business of education. It seems to me, if one can form an abstract idea of what ought to be taught, that it is to teach a person everything important to know, and at the same time to discipline his mind."<sup>1</sup> This idea is the true parent of the cramming system, which, introduced for the competitive examinations for Indian and other civil appointments, is extending to all others, poisoning the very appetite for knowledge, and rendering its acquisition too often a mockery, a delusion, and a snare. Walking last summer in the West Highlands with a young friend who had just honourably passed the competitive examination for the Indian Civil Service, and who had received high marks in geology, I ventured to ask him some question about the remarkable geological district which we were traversing; he replied, "Oh, I know nothing about it, and never did; all I got up for the examination was a cram, and I forgot the very terms before a week was over." If Mr Lowe's idea of education is that it should fill the head of the pupil with as much as it is necessary or possible for him to know, we are not surprised to find that he is chiefly guilty for the style of these examinations. Mr Lowe was secretary to the India Board at the time the writer-ships were thrown open to public competition, and he frankly tells us the system on which the examinations were framed,—a system in which he glories, and on which he has conferred the imposing name of "the science of ponderation." "We took everything we could think of that a well-educated man could learn. We took all the languages, we took Latin and Greek, we took French and English, and all the modern languages of Europe; we took the principal branches of physical science; we took history, English literature, philosophy of mind as taught in Scotland, and at Oxford, and at other places; we took everything, and we gave marks to each according to their relative importance, as near as we could arrive to it; and under that system all persons have been admitted equally and fairly to the benefits of those offices, whatever their line of study may have been."<sup>2</sup> Mr Lowe is fond of judging by results, but the system he thus inaugurated has not been long enough on trial to enable us to do this. Certainly what we hear from those who have been longest

<sup>1</sup> Primary and Classical Education, page 13.

<sup>2</sup> Address, p. 30.

acquainted with our Indian Empire does not lead us to believe that the "Competition Wallahs" are regarded as a superior race, or that their polyglot, or rather their encyclopædic acquirements command the reverence of the acute Parsee. It is not long since, that in a meeting of natives, it was actually debated whether an Englishman should any longer be saluted by the title "sahib" (sir). I cannot help thinking that the whole idea of education which regards it as a means of imparting knowledge is a mistake; that, as Coleridge long ago showed us, "as the forms of all organic existence, so must all true and living knowledge proceed from within; it may be trained, supported, fed, excited, but can never be infused or impressed." The same idea is more figuratively and beautifully but not less strongly expressed by Jean Paul Richter, who says, "The child walks hand in hand with a nature which never returns; this nature without education is a wintry desert, full, however, of spring buds, wherever a sunbeam strikes it (for all teaching is warming into life rather than sowing); there the green leaves burst forth and the whole child's life consists of warm creation days."

The great object of preliminary as opposed to professional education appears to be to cultivate rather than to inform the mind, to train men to think for themselves rather than to be the depositaries of the thoughts of others. It was in this that the excellence of the Platonic method, as opposed to the Sophistical, consisted; refusing to treat the mind as a mere passive recipient of various knowledge, Plato regarded it as possessing a germinal power which craved only for the knowledge which it could appropriate.

It may be difficult in an utilitarian age to maintain such a doctrine, but he will be the really successful instructor who, having regard to the etymology of the word, uses education as a means of drawing out, of developing the mental powers of his pupils; seeks not to make a display of present acquirements, but rather to strengthen those forces which will enable them to discover and classify for themselves, and to illustrate and expand for others. You must train, and prune, and invigorate the vine in early spring, and look for the fruit in the distant autumn, instead of forcing precocious grapes. "Behold, the husbandman waiteth for the precious fruit of the earth, and hath long patience for it, until he receive the early and latter rain. Be ye also patient."

This doctrine has the high authority of John Stuart Mill, who says, in his Rectorial Address at St Andrews, "What professional men should carry away with them from an university is not professional knowledge, but that which should direct the use of their professional knowledge, and bring the light of general culture to illuminate the technicalities of a special pursuit."—(Page 5.)

Our general idea, in short, is this, that by education we should seek to confer wisdom rather than knowledge, not to make the mind a dungeon, where all sorts of acquisitions lie huddled together in unavailable confusion, but rather to give it the power of method-



izing, arranging, and getting the full use of its various contents. The poet wisely observes,—

“ Knowledge and wisdom, far from being one,  
Have oftimes no connexion. Knowledge dwells  
In heads replete with thoughts of other men ;  
Wisdom, in minds attentive to their own.  
Knowledge, a rude, unprofitable mass,  
The mere materials with which wisdom builds,  
Till smoothed, and squared, and fitted to its place,  
Does but encumber whom it seems to enrich.”

To avoid all ambiguity, I would state again, that the objects of general education, or that which is intended to confer culture, as distinguished from special education, or that which is intended to train for special employments and trades is, first, to train and develop all the faculties of the mind ; secondly, to communicate that kind of information which forms as it were the common ground of literature and science, and the possession of which will smooth the way to further progress in these departments.

I am opposed altogether to the views enunciated by Mr Lowe. I would rather see as the result of education the human mind made an instrument of sound and enlightened power, than an encyclopædia of all sorts of useful knowledge. The latter seems the aim of Mr Lowe's science of ponderation ; and as a practical educator has well remarked,<sup>1</sup> “ I have little faith in a science of education the four fundamental principles of which severally condemn grammar, poetry, logic, and history to a subordinate place in her curriculum ; and which, when their united light is concentrated into a focus, reveal to us the study of the art of making shoes as standing ‘ on a higher pedestal than the study of the *Paradise Lost*.’ ” How strongly and well is this expressed by Dr Arnold in one of his letters to Mr Justice Coleridge :—“ And to this I find myself coming more and more ; I care less and less for information, more and more for the free exercise of the mind : for answering a question concisely and comprehensively, for showing a command of language, a delicacy of taste, and a comprehensiveness of thought, and power of combination.”—(Letter cxxii., *Life*, vol. ii., 26.)

The various branches of knowledge which experience has taught us to employ as educators, may be classed under four heads :—

1. Languages.
2. Mathematics, including Geometry, Arithmetic, Algebra.
3. Natural Science, whether exact or experimental.
4. Mental Science.

The first of these—Language—has long been considered as the most efficient instrument of education ; and I am glad to find that the Schools Inquiry Commission, in their Report published the other day, endorse this opinion, which they state to be almost universally held both by parents and teachers.

<sup>1</sup> Mr Lowe's Educational Theories examined by Hely Hutchison Almond, M.A., page 6.

The study of Language presents a twofold aspect.<sup>1</sup>

*Firstly*, The structure of the language, if highly organized, may recommend its grammatical study as a formal instrument of intellectual training of minds, that may not necessarily sympathize with the wisdom, thought, and experience which the writer may embody.

*Secondly*, The wisdom of the philosopher, the beauty of the poet, the succinctness of the historian, the eloquence of the orator, the wit of the satirist, will refine and elevate the taste of the student, and open to him a new world of beauty, conferring on him at the same time the pleasure which intellectual culture bestows.

In the former, the mind is much more powerfully exercised than in the latter, "while accurate scholarship builds up and strengthens the active faculties of the understanding, the study and enjoyment of literature awakens, expands, and educates the intellectual and moral sympathies."<sup>2</sup>

But this strong and general conviction on the mind of teachers as to the supreme power of language, and especially of the Latin language, as a means of intellectual exercise, may after all be a prejudice. The training which they employ with others is the same which they received themselves; and, perhaps, it may be supposed that they have never thought of questioning the intrinsic value of that which has been so long accepted as the main part of all educational machinery.

Let us sift the matter to the bottom; and as the question is now one of paramount importance, I make no apology for considering it at some length. Perhaps the best mode of procedure will be to consider, in the first place, the various faculties of the mind, for the educating and forming of which education is required, and then we shall be the better prepared to consider the real value of our educational instruments as means of operating on these faculties.

In the Table No. I, I have placed before you a concise summary of the intellectual powers of the mind, of the most elementary kind, and avoiding as far as possible all metaphysical ambiguities. To it let me direct attention with a view of considering the nature of these powers and the effect of education in developing them.

### TABLE I.—*Intellectual Faculties of the Mind.*

#### I. PRIMARY.

- |  |  |
|--|--|
| A. Apprehension—expressed by "a term" derived from |  |
| B. Sensation, or Perception, or                    | } informed by the senses or consciousness. |
| Reflection, . . . . .                              |  |
| C. Memory—for retaining and recalling.             |  |
| D. Judgment—expressed by "a proposition."          |  |
| E. Reasoning—                                      | "an argument."                             |

<sup>1</sup> See this subject discussed at length and with great power and eloquence in Professor Sellar's *Theories of Classical Teaching*.

<sup>2</sup> Sellar, *op. cit.* p. 24.

## II. SUBORDINATE.

- A. Attention.
- B. Conception.
- C. Association.
- D. Abstraction and Generalization.

## III. CREATIVE.

- A. Imagination.
- B. Taste.
- C. Genius.

The mind can only operate on facts supplied from one or other of two sources,—the world of matter outside, in regard to which it is informed by the external senses; and the world of spirit within, the operations of which are revealed by consciousness. The first part of education which nature herself undertakes in the infant, is the education of the senses to quickness and accuracy of perception by the objects around us; and the senses are also specially addressed in the most rudimentary form of scholastic education which deals first with words, either written or oral, as the representation of things.

The seizing of the external object by the sense is called Apprehension, while the mental faculty by which it is appropriated is called Sensation or Perception, which accordingly we find at the head of the Primary intellectual faculties in the Table. It is my object to show how every one of the Mental Faculties is exercised in the study of language. You must therefore note, that when a language is studied orally, the sounds which compose the words are apprehended by the ear, and become the objects of Sensation or Perception in the mind; that if the language be written, the only difference is that the eye rather than the ear is the sense which apprehends it. If the language be studied partly orally and partly graphically, then both ear and eye are exercised.

The next mental power in the table is Memory, and it is scarcely necessary to show how constantly it is exercised in the grammatical study of a language. When the pupil becomes sufficiently familiar with the word or the sound as to recognise it again when presented to him, the memory has been called into play, although its further development requires that sensations shall be awakened by past sensations without the recurrence of the sensible object. Memory gives stability, permanence, and effect to the acquisition of knowledge, and has been well called "the cement of the edifice of truth." It is the storehouse of those experiences which guide us in our conduct, and of those ideas which reflection converts into knowledge. It is an important truth in regard to the exercise of memory, that the vividness and capability of being retained, of the ideas which it has received, will be in proportion to the amount of Attention exercised in acquiring them. "Nec dubium est," says Quintilian, "quin plurimum in hac parte valeat mentis intentio, et velut acies luminum a prospectu verum intuetur non aversa."



This introduces us to another, though subordinate, power of the mind—Attention—one which especially requires and benefits by diligent cultivation.

Recurring to the example of the child, we find that the development of memory is followed by that of another power. He soon begins to compare one object with another; the taste of salt and sugar at first undistinguishable by him, soon cease to be alike, and a marked preference is shown for one over the other. He will instinctively turn to the most striking of two objects,—the brightest light, the loudest sound, will attract his attention. At a further advanced age he will measure by the eye and correct the sight by the touch, the sizes of objects, or will compare the taste and smell of different bodies. This is the commencement of the exercise of Judgment, one of the most important faculties of the mind. Closely allied with Judgment is Reasoning, that mental power or combination of powers by which the results of judgment are compared, conclusions drawn, and truth arrived at. Whately thus clearly explains the operation of this faculty,—“There are three operations of mind in argument: Apprehension, that is the notion in the mind analogous to perception by the senses; Judgment, the comparing of two notions that are the objects of apprehension; and Reasoning, the proceeding from one judgment to another founded thereon, reproducing the result. The expression of the apprehension is a Term; the expression of the act of judgment is a Proposition; the expression of an act of reasoning is an Argument.”

We have thus passed to certain qualities of the mind of a higher order, by which man is distinguished from the lower animals, and which constitute him a Reasonable Being.

The inferior animals have Sensation and Memory, but are devoid of reason and judgment. Therefore it is that language, and its representation by characters, which are in fact the commutation of our perceptions for a significant sound or word communicable to others, is comprehensible by man alone of all animals—“Words are the floating currency of the mind, the efficient materials for the perspicuous expression of thought.”

If the truth of the preceding be admitted, you will estimate at its true value Mr Lowe’s sneer at the study of words instead of things in modern education. As well might he reclaim against the use of the symbols in Algebra, or the figures in Geometry in the teaching of these sciences. Surely when he penned his unfortunate contrast between “things” and “words,” deliberately giving his preference to the former over the latter,<sup>1</sup> his eyes must have blinked or been blinded for the time by the flood of light which Philology, so largely developed in our day, is throwing on the past, connecting the present with it by lineal descent, and in its great modern development

<sup>1</sup> “I think it will be admitted by all who hear me, that, as we live in a universe of things and not of words, the knowledge of things is more important to us than the knowledge of words.”—Lowe’s Address, page 14.

doing much, and promising to do still more, to solve many of the obscurest problems of the origin and early history of our race.

There are two subordinate faculties, on the operations of which Judgment is dependent—Abstraction and Generalization. Abstraction designates the process by which, in contemplating any object, our thoughts are directed to some one part or property exclusively. Generalization indicates the process by which the mind occupies itself with like parts or properties in different objects; and in consequence of their possessing these like parts or properties, includes them in one genus or kind. If the Judgment be that faculty which compares objects so as to ascertain their mutual relations, abstraction and generalization are the powers which it employs to carry out its operations; for by them is performed the training, sorting, and classifying of all the materials of which sensible and conscious experience is composed.

If there be any truth in the preceding remarks, you will readily see what an important place Grammar must hold as a means of educating the mental powers.

The first of our mental faculties which awakes is Perception, which enables us to note some existences external to our senses, and the first part of speech is the Noun Substantive, expressive of substantive or independent existence. Nouns are, in fact, as Vossius tells us, either perceptions of substances—Substantives; or perceptions of attributes,—adjectives.

In Table II., taken from Stoddart, the various parts of speech are exhibited, showing how the logical faculties of the mind are necessarily trained by their study.

TABLE II.—*Classification of Words.*

WORDS	I. Used in enunciative sentences.
	A. Principal Words.
	a. The Noun, or name of a conception.
	Primarily,
	α. If expressive of substance (Substantive).
	β. If expressive of quality,
	Without action (Adjective).
	With action (Participle).
	Secondarily (the Pronoun).
	b. The Verb, or expression of an assertion.
	B. Accessory Words.
	a. The Article defines extent of conception.
	b. The Preposition, relation of one substantive to another.
	c. The Conjunction, connecting one assertion with another.
	d. The Adverb, modifying conception or assertion.
	II. Used in passionate sentences or as expression of Passion (the Interjection).

*From Sir J. Stoddart.*

In the following Table (III.), constructed from the same author, the nouns are exhibited according to the alterations which they undergo in actual use, in changes in gender, number, and case, usually ex-

pressed in the ancient languages by alterations of the terminal syllable, often expressed in modern languages by the introduction of particles.

TABLE III.—*Differences of the Noun in Language—i. e., of the term in a Syllogism.*

ESSENTIAL	{	In Kind,	{	Corporeal. Mental.
		In Gradation,		Genera. Species. Individuals.
ACCIDENTAL	{	In Number,	{	Singular. Dual. Plural.
		In Relation,		To other Nouns. To Verbs.

1. *From their differences in kind* we learn to distinguish between the sensations produced by ideas from without or from within.

2. *From these differences in gradation* we learn to divide them by abstraction and generalization into Genera, Species, and Individuals.

3. *From their differences in number* we learn to reverse the foregoing process, and do analytically what in gradation we had done synthetically, resolving genera and species into the individual units of which they are composed.

This distribution of the Noun into genera, species, and individuals, is at the root of Logic; and from a study of it we see how the forms of language correspond with the universal forms of reasoning. In inductive reasoning we ascend from particulars to generals, from individuals, through species, to genera. In syllogistic reasoning we proceed from generals to particulars. The keystone of the whole art is contained in the simple but comprehensive dictum of Aristotle, the *dictum de omni et nullo* as it has been called, that whatever can be predicated (affirmed or denied) of a class universally can be predicated of anything contained in that class. The genus is an idea including the species, and the species is an idea including the individual. The two first classes are expressed in grammar by common nouns, while the individual is either expressed by a proper name or by a common name, individualized by the aid of an article or pronoun.

Time will not permit me to analyze in the same way Gender and Case in Nouns, or to show the relation between the fundamental laws of thought and the adjectives with their degrees of comparison. Let me only instance the Verb, that part of speech which first affirms conscious existence either in action or passion,—to be—to do—to suffer.

If this consciousness of simple existence be, as many maintain, the source and necessary condition of all other powers, you will see



how the Verb To Be is at the root of all Mental Philosophy. To Be implies conscious existence; To Do introduces us to the active forms of the Will, which chooses or refuses, accepts or rejects—the manifestations of which are the dispositions, affections, and passions; To Suffer indicates the state in which the mind is supposed to be the passive recipient of external impressions, which refers us back to sensation and those avenues by which external things and their qualities reach our mind.

What the foregoing instances illustrate holds good throughout the whole of grammatical study, which is at once a science and an art. "If grammar," remarks an authority before quoted,<sup>1</sup> "is not a true science, if rules are not the 'media axiomata' which give form and consistency to its principles, if it does not teach order and logical method as well as words and names, it is high time that the system of education which has been based on the scientific and logical study of grammar should be, not reformed, but utterly swept away. The nations of Europe, the great nations of the ancient world are involved, with ourselves, in the same condemnation. The whole intellectual training of civilisation has been founded on a delusion! . . . I am going to assume that grammar is a science, that its subject-matter is language, that the ordinary generalizations of nominative and verb, of optative moods and conditional clauses, are, in the main, as true to facts as the generalizations of other sciences; that the laws of language which it investigates are not arbitrary creatures of the imagination, but express realities existing in language; and that there are rules deducible from these laws of which it is no nearer the truth to say, as Mr Lowe does, 'that you never know whether they apply or not,' than it is to make the same assertion of the rules of applied botany, or applied geology, or of any other science, except those which are purely mathematical and exact. And I am also going to assume that grammar is not only a science, but is also an art, and that it is because the teaching of an art which we must use ought to go, and, to a certain extent, must go hand in hand with the teaching of a science, that grammar holds a place in our educational course which cannot be occupied by any science whose subject-matter is something external to the human intellect."

Contrast with this opinion of a practical educator that of the right honourable gentleman, the inventor of the "ponderation system" as applied to knowledge, and of the "result system" as applied to education. Mr Lowe's idea of grammar was thus delivered to his Edinburgh audience:—"If language had been made on a set of general principles—if it had been laid down by the wise men of all generations that the nominative should always agree with the verb, and a verb should always govern the accusative—and language had been made like Euclid, every one of these rules which had been tied we could untie, and a

<sup>1</sup> Almond, *op. cit.* p. 9.

language having been put together in that way, we could analyze it into rules. But, gentlemen, language was not so made. Language grew, we know not how, like a tree or a plant; it was not made under general rules, and therefore when you are trying to form general rules for it, you are sowing the sand; you will never attain what you want," etc. (page 19). It is impossible that Mr Lowe can really be so ignorant as this memorable sentence would make him. He must know something of Comparative Philology; he must have studied general grammar; he must know that there are other sciences besides the exact, and would have been strangely at a loss to have named any one science which had been framed according to his ideal: a congress of learned men of all nations, and almost necessarily of all times, having made general rules, the science was then constructed to fit the rigid requirements of a bony skeleton thus provided. "Language grew, like a tree or a plant," and therefore there can be no scientific rules applicable to it; as if we had no botany, and no vegetable physiology to explain the laws of growth of plants that "grow we know not how;" just as we have rules of grammar not laid down beforehand for grammar to be founded on them, but deduced from the actual existing state of grammar, and founded on the adaptations of that science to the felt necessities of the mental faculties.

But enough has been said to vindicate the use of grammar as one of the first educators of human intellect. Some special grammar must, however, be selected; and we think the nearly universal testimony of all teachers will endorse the opinion of the Schools Inquiry Commission just published. The Commissioners are clear in their preference for Latin, partly on account of the beauty of the language in itself, but mainly for the fulness and precision of its accidence, in which no modern language can rival it.

A veteran professor, who spent a long and laborious life in communicating instruction, has left on record his opinion, "that in the study of language when properly simplified and explained we find for our pupils a constant exercise in practical logic, which brings into play the powers of memory, of judgment, of abstraction, and combination of ideas, and of reflection on the subjects of our own consciousness, which induces habits of quiet and sustained attention, facility in sifting and comparing evidence, and promptitude in deciding; which produces, in short, a general acuteness and activity of the intellectual powers."<sup>1</sup>

But Mr Lowe and his science of "ponderation" come in here and meet us with this observation, which must be answered in passing,—“I think it is a poor and imperfect conception of education that should limit it to the learning of any language whatever; but surely if we are to make language the whole or a part of education, it should be the language we are most concerned with; and I

<sup>1</sup> Pillans's *Objects and Method of Education*, p. 35.

must be permitted to say that, in my science of ponderation, I think English has a prior claim over Latin and Greek."<sup>1</sup>

Mr Pillans has dealt with this argument, which, of course, comes to the surface on all those periodical occasions when an anti-classical fever becomes epidemic. His opinion is that, "with English authors, that mental culture which it is the object of the grammatical study of a language to confer, could not be given at all." I have not time to quote at length all his arguments, a sentence or two must suffice:—

"The ancient are languages of flexion and conjugation, expressing the relation of things to one another, and the variations of the verb in time, person, number, mood, and voice, by changes in the termination of the words, all or nearly all of which we (English) express by separate small particles and monosyllables, which, to prevent ambiguity and confusion, have their places fixed, and must stand in juxtaposition to the words they are intended to affect. Hence, two results: one, that our English sentences admit of very slight and rare deviations from a precise definite arrangement of words; and the other, that modern and more especially English composition is necessarily overrun with monosyllables, most of which, in our language at least, terminate in consonants. The ancient languages, on the contrary, from the circumstances of their incorporating the expression of various relations among objects and ideas into the words themselves, derive two advantages,—first, by avoiding a crowd of such little words as enumber our diction they acquire a pomp, sonorousness, and condensation of meaning, 'a long resounding march and energy divine,' which we cannot look for in our modern dialects; and, secondly, they admit a variety in the collocation of words, and a freedom of transposition which materially contributes, in the hands of an accomplished writer, both to mould his periods into the most perfect music and melody to the ear, and, what is of more consequence still, to present them in the most striking forms to the understanding and imagination of the reader."<sup>2</sup>

But the study of the classics has a twofold operation. We are made familiar both with the meaning and the expression of the ancient authors. The study of their meaning is, as has been shown, an intellectual exercise of the greatest value. Acquaintance with

<sup>1</sup> *Op. cit.* p. 57, *et seq.*

<sup>2</sup> How beautifully this is illustrated by Dr Arnold:—"My delight in going over Homer and Virgil with the boys makes me think what a treat it must be to teach Shakespeare to a good class of young Greeks in regenerate Athens; to dwell upon him line by line and word by word, in the way that nothing but a translation lesson ever will enable one to do; and so to get all his pictures and thoughts leisurely into one's mind, till I verily think one would, after a time, almost give out light in the dark, after having been steeped, as it were, in such an atmosphere of brilliance. And how could this ever be done without having the process of construing, as the grosser medium through which alone all the beauty can be transmitted, because else we travel too fast and half the beauty escapes us. Shakespeare with English boys would be but a poor substitute for Homer."—Letter to Mr Justice Coleridge, exxxviii., vol. ii., p. 49.



the way in which they expressed their thoughts is important for training the taste, by the use of models which are universally appealed to as a standard measure, if not of perfection at least of excellence. Even if, in pursuing classical studies, the student should never acquire the power of reading ancient authors with ease, yet the time devoted to the pursuit cannot be considered as absolutely lost. If a student has been enabled, even with pain and difficulty, to obtain a full perception of the author's meaning, he has been subjected to a most valuable intellectual exercise. If he has acquired the ability to express that meaning in another language, he has been put through a most useful and necessary practical discipline. And even the most utilitarian educator will be forced to admit, that a knowledge of English will be most easily and most correctly acquired from a knowledge of Latin.

The Schools Inquiry Commissioners remark that "nothing teaches English grammar so easily and so well as Latin grammar." Professor Blackie characteristically observes,—“The ancient languages are certainly far away from us in point of time, so is Kamtschatka in point of space; but the distance has nothing to do with the matter. The decisive point is, where does the vital connexion lie? The vital connexion of a tree is with its root, and the root of our modern English culture lies much more in Greece or Rome than in Berlin or Paris. In this way Greek and Latin are more to us, and more necessary than French and German.”<sup>1</sup>

If the ordinary Englishman can scarcely understand his own language without a knowledge of the classics, what are we to say of those who would discard them as necessary requirements from those who aspire to be members of a learned profession, or argue, as some have not hesitated to do, that a knowledge of them is an unnecessary acquirement for scientific men? I am far from saying that many modern sciences, chemistry, botany, and the like, may not be studied profitably without a knowledge of the classics. One thing however is certain, they will require, as far as scientific terms and scientific conceptions are concerned, to be studied much more painfully; and the student, however conversant with his subject, will perpetually run the risk of offending the ears of educated men by false quantities and other mispronunciations.

Those of us who have acted on boards for examining entrants to our profession, are well aware of the ignorance in this respect of many of our candidates, notwithstanding that we profess to exact a sufficient preliminary examination. I remember being annoyed long by one flippant student, who at length, when I asked him a question about *Angina pectoris*, repeated the words after me, *Angina pectoris*, as if to show his superior knowledge to that of his examiner. Tortured beyond further endurance, I exclaimed, “Oh! do learn to pronounce your words with some regard to their derivation.” “I assure you, Sir,” said he complacently, maintaining his assumed

<sup>1</sup> On Education, p. 37.

superiority, "we always pronounce them that way in London." This was, of course, as he intended it should be—unanswerable.

If, however, we regard education from Mr Lowe's point of view, and propose as its end the acquisition of a kind of knowledge which shall be immediately convertible into coin, the god chiefly worshipped in this money-making age, then am I free to confess that a full and philosophical study of language, and of grammar as a stepping stone to it, would be time misspent; if, however, we are to judge of the effect of education by the extent to which the mind has been exercised and developed, by the powers which have been strengthened for contests in the battle of life, by the amount of thought which such training has called into active operation, you will admit that the *literæ humaniores* must take the foremost place as educators of the intellect.

Add to this what Mr Mill has so well stated, not only in his Rectorial Address, but also in his earlier writings. One sentence only from the former I will quote:—"In cultivating, therefore, the ancient languages as our best literary education, we are all the while laying an admirable foundation for ethical and philosophical culture. In purely literary excellence—in perfection of form—the pre-eminence of the ancients is not disputed. In every department which they attempted, and they attempted almost all, their composition, like their sculpture, has been to the greatest modern artists an example to be looked up to with hopeless admiration, but of inappreciable value as a light on high guiding their own endeavours. In prose and in poetry, in epic, lyric, and dramatic, as in historical, philosophical, and oratorical art, the pinnacle on which they stand is equally eminent."<sup>1</sup>

It does appear to me, that however you may expel the classics from the education of the mere tradesman, shopkeeper, or lower rank of merchant, who does not aspire to associate with educated men, you cannot dispense with them in the case of any who purpose to enter one of the learned professions or to exercise an influence on or mould the opinions of his age. "Where can we acquire such lessons in the first principles of politics and social science as from a study of the causes which led to the rise and fall of the ancient commonwealths, and a familiarity with the philosophical system of law framed by the Romans? Where can the inquiring intellect learn such lessons in the investigation of truth as are taught both by precept and example in the dialectics of the ancients? Who would think of studying philosophy without sitting at the feet of Plato and Aristotle? or who aspire to a cultivated taste that has not been formed on the models of ancient Greece and Rome, for all our great philosophers, poets, and orators confess to having been nourished with the spirit of antiquity?

"Hither as to their fountain other stars  
Repairing, in their golden urns draw light."

<sup>1</sup> Rectorial Address, p. 17.

While I thus insist on the necessity of the Latin language as the best fitted to train and draw out the mental powers, I am free to admit that the mode in which it is taught in many schools, especially in England, is susceptible of great improvement, and that it never ought to be made the *sole* means of education.

I would of course expect that no one would commence his medical studies without a thorough knowledge of his own language, and without proving his competence to write it grammatically. The lamentable instances of defective grammar and defective spelling which come before our Examining Boards, when testing the professional knowledge of the candidate, abundantly show the low amount of mental culture which is supposed to be sufficient to qualify a man to pursue one of the most philosophical sciences and to practise one of the most difficult arts. A thorough knowledge of English should be required, and a failure in this should exclude the candidate from enrolling himself as a student of Medicine.

The Medical Council, after a keen debate, and by a narrow majority, have determined to make a knowledge of Greek essential before any student can commence his professional studies. I doubt the wisdom of this. With all my anxiety to see a high standard of general education, I would rather see less demanded and its possession more thoroughly tested. For the higher grades of the profession, for the Doctor of Medicine, who conjoins the testamur of the university to his scholarship to that of his professional skill, a knowledge of Greek is indispensable. Wherever high mental culture is prized, the language and literature of Greece will ever hold a pre-eminent place. But to demand a knowledge of that language from every village surgeon, every "rough and ready practitioner," is a thing which will not be obtained, and will therefore be a mockery and a delusion. If I can read the signs of the times, while the study of Latin will be retained and even extended in our schools, that of Greek will become less general,—a prediction which seems borne out by the Report of the Schools Inquiry Commission:—"It seems to be generally agreed that, except for education of the first grade, Greek cannot be usefully taught, and even in that grade it seems to be the prevailing opinion that Greek should not be considered absolutely essential."

While thus advocating the necessity for the thorough mastering of the Latin language, and vindicating the importance of efficient instruction in the English language, the claims of other modern languages must not be forgotten. Latin has been well called "the common gateway to French, Italian, and Spanish," and if it has been thoroughly mastered the acquisition of any of these will be easy. As a means of mental training, the French is second only to the Latin grammar. A knowledge of it, too, is of marketable value, which will please the "result school," while a living, being always less likely to be forgotten than a dead language, its acquisition is probably a more permanent possession. Add to this,



too, the fact that the French are among the most diligent cultivators of medical science, and that many of their professional treatises are of great value, and we have ample reason for considering a knowledge of the French language as almost indispensable to the student of Medicine.

Of German I will scarcely speak: while the ability to read with ease the many profound and scientific treatises which the country has produced will ever be an acquisition greatly to be prized by any student, I do not suppose that any one would think of requiring its possession as an essential preliminary to entering on medical study, while all would regard its possession as an accomplishment of very great value.

In the early universities the great preliminary branches of knowledge were divided into the *trivium*, containing Grammar, Logie, and Rhetoric, and the *quadrivium*, comprehending Arithmetic, Geometry, Astronomy, Music; the two together constituting the *liberæ artes*.<sup>1</sup> I take now, therefore, from the quadrivium our second class of subjects, Mathematics.

The very name given to this branch of learning, which has no reference to its subject-matter, but only to its supposed effect on the mind, shows the high place which the ancients assigned to it as a trainer of the mind. The Greek *μάθησις* is translated by the Latin *Disciplina*, and, divorced from its original meaning, which the Latin equivalent word has retained, is now applied to all knowledge regarding space and number, which the ancients seemed to have considered as *the* discipline for enlarging the mind,—a circumstance in itself sufficient to lead us carefully to consider the value of these branches of study as means for this end. Even Mr Lowe forgets his “ponderation system” when speaking of Mathematics, and regards them “as a most admirable study, and calculated to train the mind to strict habits of reasoning, and habits of close and sustained attention,” as if the ponderation system took training into account at all, and did not profess to limit itself to considerations of practical utility. His meed of praise is, however, confined to synthetical mathematics, analytical he unequivocally condemns, for the somewhat peculiar reason, that “it approaches the subject analytically, which is not a good way of reasoning.” It seems scarcely necessary to defend from such attacks the method which conducted Leverrier and Adams to the discovery of Neptune,—a practical application, by the way, which should not have been forgotten in the “science of ponderation.”<sup>2</sup>

Whether we have regard to the preeision of the definitions from which it starts, the caution which it exereises in admitting nothing which is not or cannot be made most evidently true, the severe reasoning by which its conclusions are arrived at, the certainty

<sup>1</sup> Huber, *The English Universities*, translated from the German, by T. Newman, vol. i. p. 4.

<sup>2</sup> See Almond, *op. cit.*, p. 7.

of its results, and the different ways in which they may be verified, the concentration of mind which its pursuit demands, we cannot fail to see how fitted the study of Mathematics is to give correct habits of judgment, to sharpen the powers of investigation, to discipline the reasoning faculty in matters from which self-interest, preconceived opinions, and all other disturbing elements are carefully excluded.

The main branches of mathematical science are Arithmetic, or its operative process of Algebra, and Geometry, springing out of the simple notions of number and space. It is not, however, only as a means of disciplining the mind that these studies are valuable, they form the only gateway through which many of the sciences can be properly approached.

Of the importance of Arithmetic and Algebra as branches of elementary education, there can be no doubt, and the Schools Inquiry Commission record that most of the witnesses "seemed to look upon arithmetic as simply indispensable" (Report, pages 22 and 29). "Both for its utility and its educational power, nothing else can stand in its place. It has not, of course, the breadth which belongs to the study of language. But it has still greater power of exercising the reasoning faculties, and it is the gateway not only to all natural science but to a very large part of men's dealings with each other" (Report, page 29). It is probably for this last or utilitarian reason that the science of ponderation gives it a high place in its list, and that it finds favour even with the cynical Mr Lowe, who says—"I think it more important that a man should be able to work out a sum in arithmetic, than that he should be acquainted with all the abstract principles of Aristotle's logic; and that the moods of a syllogism are not so important as the rule of three, practice, and keeping accounts."<sup>1</sup>

Algebra is more nearly based upon definition than either arithmetic or geometry: the results of its fundamental definitions are deduced from symbols, which are used in a prescribed manner, and imply operations on magnitude. It is a science of operation or process of an abstract character, being utterly apart from any of our ordinary notions. It is a powerful trainer of the mind, and now forms part of the education of every gentleman.

The College of Surgeons of Edinburgh, which seems, of all the licensing bodies in the country, to have been the earliest to awaken to a sense of the necessity of enlarged general education, has for many years past prescribed Mathematics (in its restricted sense) as one of the indispensable branches of study for its license. Perhaps in so doing it had regard as much to the bearing of the study on that of Anatomy and Surgery as to any power which it possesses as an educator. "How can the student compass the rigid detail of descriptive anatomy without a more than vulgar acquaintance with mathematical nomenclature? How can the exquisite contrivances

<sup>1</sup> Address, page 15.

of the skeleton be otherwise than a conundrum to him unless he have prepared himself with a study of the simple mechanical appliances?"<sup>1</sup> Be this as it may, the example thus set is not the less laudable.

The Schools Inquiry Commissioners are of opinion that "no one can doubt the value of geometry as an exercise in severe reasoning. . . . There were a few indeed who would put mathematics distinctly above all other subjects as a means of education, but on the whole there appeared to be no general desire to push the cultivation of mathematics very far." The Commissioners ascribe this in some degree to the fact, that the teaching of mathematics in English schools is rarely satisfactory: the Scotch burgh schools were found much superior to the average English schools in mathematics, which is ascribed to the practical turn given to their mathematical teaching.<sup>2</sup> On the whole, it may be said, that while there is no difference of opinion as to the value of mathematics as a branch of general education, its right position in the scheme is the great difficulty. There is no doubt that its precise and rigid demonstrations cannot be approached with advantage until the reasoning powers are tolerably developed, which they seldom are when the study of Mathematics is commenced. Professor Airy thinks that the amount of Geometry which the mind of a boy of sixteen or seventeen is capable of comprehending is very small indeed, and Mr Almond, concurring in this, is of opinion "that a great deal of time is often wasted by boys beginning to learn it before their reasoning faculties are sufficiently developed, is the experience of most practical educators."<sup>3</sup>

Without presuming to dictate on a subject of such difficulty and importance, I would venture to suggest that the study of Mathematics would be greatly facilitated if the student brought to it some previous knowledge of the art of reasoning, and some familiarity with the nature of Assertion, Denial, and Deduction; such a study at an earlier period than it usually takes place would enable pupils to approach every subsequent branch of study, and especially Mathematics, with a more limited and defined idea of the precise meaning and extent of words and phrases than is to be learned in the ordinary use of language. The study both of Arithmetic and Geometry should also, in the earlier lessons at least, be made strictly demonstrative, every assumption should be explicitly stated, and every inference logically deduced. Arithmetic almost universally, and Geometry very generally, are in this country taught by dogmatic rules, of the reason of which the student has not the slightest conception, so that his memory rather than his judgment is exercised, and these studies are thus often made to miss their mark as intellectual factors.

The place which Geometry should occupy in the educational

<sup>1</sup> Sir John Simon's Observations on Medical Education.

<sup>2</sup> Report, pp. 30, 31.

<sup>3</sup> Almond, *op. cit.*, p. 7.



course is of importance, not only on its own account, but in reference to a question much agitated at present—the introduction of some branch of natural science into a proper scheme of primary education.

The study of Natural Science as a branch of Primary Education must be limited by three considerations—

1. The amount of time which can be allowed for it.
2. The previous mental acquirements of the pupils.
3. The object which is proposed in teaching it.

If there is any truth in the preceding arguments, it is plain—

1st, That those who regard the mental training which it confers as the chief object of education will not allow of the displacement of any of our existing intellectual factors to make room for one the value of which is at least not superior to them.

2d, That, as the exact sciences cannot be efficiently taught without a certain knowledge of Mathematics, and as we have shown that Mathematics cannot be studied with success until the mind has attained a certain stage of development, the time when instruction in these sciences can be commenced with advantage is necessarily not very early in the preliminary course.

3d, That, as in accordance with what has been already shown, the perceptive faculties are the first to unfold themselves in the mind, those sciences which demand observation should be first cultivated, the pupil being encouraged to acquire the facts in the first instance, the classification, arrangement, and study of the inferences drawn from these facts being left to a later period.

4th, It should be distinctly understood that the observation of these facts, and the retaining of them in the memory, is prescribed as an intellectual exercise rather than on account of any information they may give, however valuable that information might prove in after life,—for facts so acquired, unless cemented in the mind by the philosophy of the subject, would be forgotten more surely, more entirely, and with less possibility of recovery than the Greek or Latin languages, the rapid effacing of which from the memory is so feelingly deplored by Mr Lowe.

While some of the more ardent advocates of the change dwell upon the extension of the sciences as a strong argument in its favour, I am free to confess that this has always appeared to me to be one of the chief difficulties. At the stage of mental development with which we have had to do, it must be chiefly the facts and objects of the science, and a very few general principles, which can be taught. But the mass of facts of any one science is now so great as to render it impossible to teach them as part of general education, and we are forced to leave them to be acquired as part of their professional education by those whose professional duties require their mastery.

There is a twofold evil to be guarded against, *first*, the risk of cramming the mind with facts, however valuable, as information, which will only overload and choke rather than develope and educate

the mental powers; *second*, the risk of merging the general in the professional education; and there could scarcely be a greater evil than that the general education should cease to be such as will train the mind by thorough and systematic study in such branches of learning as will best develop its powers, and form a foundation for, rather than an introduction to, all future professional or special acquirement.

With these cautions, there is no doubt that there are certain powers of the mind which can be better exercised by the study of the physical sciences than by any other means, for

"All natural objects have  
An echo in the heart. This flesh doth thrill  
And has connexion by some unseen chain  
With its original source and kindred substance :  
The mighty forest,—the proud tides of ocean,  
Sky-cleaving hills, and in the vast of air  
The starry constellations, and the Sun,  
Parent of life exhaustless—these maintain  
With the mysterious and breathing mould  
A co-existence and community."

In the study of the natural sciences, an eloquent author has well remarked, "Curiosity is ever excited, attention rivetted, and memory bribed by perpetual novelty, variety, and beauty; the comparing power is ever kept alive by an endless succession of similitudes and contrasts, that now sustain the interest by inducing the pupil to note the like in the different, and the different in the like, and now reawaken the flagging attention by renewed excitement and gratification of the senses; and the reasoning power is finally evolved in order to trace and explain the varying adaptation of means to proximate ends, displayed in instincts which anticipatively rehearse the functions of that faculty, which, when enlightened by reason, and directed to ultimate ends, becomes human understanding. Thus as the student watches the ascension of nature into mind, he shall learn that up the whole ascent nature is a prophetic hymn, heralding the advent of man, and proclaiming the wisdom and goodness of the Creator."<sup>1</sup>

On the whole, I am inclined to think that the part of the Report of the Schools Inquiry Commission which deals with this important subject is not the least valuable.<sup>2</sup> It shows how the claims of natural science as a branch of primary instruction have been much pressed by high authority; how the evidence of witnesses who were not schoolmasters was favourable to the introduction of some branch of natural science as a part of primary education; how the evidence of the schoolmasters shows great division of opinion on the subject; how there are three great difficulties in introducing natural science as a branch of education, the want of suitable teachers, the want of suitable text-books, the want of suitable rooms and appa-

<sup>1</sup> Green's Mental Dynamics, p. 4.

<sup>2</sup> Pp. 32, *et seq.*

ratus. The conclusion the Commissioners arrive at is as follows :—  
 “We think it established, that the study of natural science develops better than any other studies the observing faculties, disciplines the intellect by teaching induction as well as deduction, supplies a useful balance to the studies of language and mathematics, and provides much instruction of great value for the occupations of after life.” The Report recommends Physical Geography as the best starting point. This should, in the opinion of the Commissioners, be followed by some branch of science which would not tax more than the powers of simple observation. “But when the pupils reach the age to be taught natural science with scientific precision, the subjects best adapted for teaching above all others are experimental physics and chemistry, inasmuch as they constitute the platform of all the rest.”

When we find that the Commissioners recommend this by way of addition, not substitution, to the existing range of education, we remember how forcibly the extent of science contrasts with the brevity of life.

The whole business of the physician in his daily avocation is to discover and ascertain truth. The symptoms which he discovers by observation he either analyzes that he may get them in their purest and most simple form, or he synthetically combines them according to their mutual connexions and affinities. In either case they are made the material on which his reason operates, whether his object be to determine the true nature of the disease, the true state of the internal organ affected, the probable character of the change which it has induced in other organs or tissues, the cause of such change, or how a deviation from the normal state of one organ should be followed by a deviation in another; the precise action of each remedy which he employs, and so on throughout the wide range of inquiries which the philosophical exercise of his profession embraces.

It is scarcely necessary to say, that our conclusions from any of these premises are liable, like all other conclusions, to be vitiated by any fallacy which may occur, either when listening to nature in observation, interrogating her in experiment, or endeavouring to ascertain the reciprocal relations of cause and effect on which the medical art is grounded. There is, perhaps, no art, the whole processes of which are so liable to the intrusion of fallacies as that of Medicine. Looking back on its past history, it is impossible not to see how much its scientific progress has been retarded by the operation of such fallacies. Some have arisen from imperfection in the ancillary sciences, some from the tendency to theorize, and the neglect of the true principles of inductive science; some from the ambiguity of language, some from the fallacy of testimony, some from the fluctuating character of the phenomena with which we have to deal, and the impossibility of finding two human beings perfectly alike; so that, while in the objects of inanimate nature



it may generally be assumed that what has a given effect on one substance will have a similar effect on another of the same kind, there is no such uniformity when the animal bodies, with the various actions and reactions peculiar to life, are the subject of observation.

He who aspires scientifically to practise his profession ought therefore to be skilled in judging correctly of evidence, and able to use his reasoning powers. In this, after all, will be found to consist the difference between the ability and skill of one physician and that of another.

"The intellectual part of our education has nothing more important to do than to correct and mitigate this almost universal infirmity (inability to estimate evidence)—this summary and substance of nearly all purely intellectual weakness. To do this with effect needs all the resources which the most perfect system of intellectual training can command. Those resources, as every teacher knows, are but of three kinds: first, models; secondly, rules; thirdly, appropriate practice. The models of the art of estimating evidence are furnished by science, the rules are suggested by science, and the study of science is the most fundamental portion of the practice."<sup>1</sup>

In what has been already said, we have shown that in the study of Grammar we get our first ideas of reasoning; that in Geometry we learn, first, clearly to state our premises, secondly, to make sure of each step in the reasoning before we ascend to the next, and it is only by thus clearly verifying each step in the process, and thus accurately defining each premiss which we reason from, that we can make sure of the validity of the conclusion at which we arrive. There is, however, another form in which we investigate truth. The one just described is illustrated in Mathematics and the exact sciences; in what are called the experimental sciences, the process of reasoning, though different in form, is essentially the same in character. We start now from a premiss rigidly determined and fixed; we perform an experiment, the results of that experiment are the premises from which we argue to the conclusion at which we arrive. This mode of reasoning is peculiarly applicable to Medicine and to all arts which profess to act upon or draw inferences from experience. Just as a person from habit and association may talk and write grammatically without learning a single rule of grammar, so it is quite possible that a person may reason correctly without a knowledge of the laws of logic. It is the province, however, of logic to lay down the rules which all correct reasoners must follow, whether they know it or not. In a science and art such as Medicine, so beset with fallacies, it is peculiarly necessary that we should have a facility for detecting them, and this will be most easily given by familiarity with those rules which, whether intended to guide us in pure reason or in the pursuit of truth by induction, are the simplest

<sup>1</sup> Mill's Inaugural Address, page 23.

means of detecting fallacies, and of preserving us from error in our intellectual operations. "When I consider," says Mr Mill, "how very simple the theory of reasoning is, and how short a time is sufficient for acquiring a thorough knowledge of its principles and rules, and even considerable experience in applying them, I can find no excuse for omission to study it on the part of any one who aspires to succeed in any intellectual pursuit. Logic is the great disperser of hazy and confined thinking. It clears up the fogs which hide from us our own ignorance, and make us believe we understand a subject when we do not."<sup>1</sup>

If these views be correct, it may well excite surprise that the Medical Council have not added Logic to the branches required for the general education of the physician. Individual members may, and I know have, contended for this addition, but hitherto without success. It is fortunate, however, that it does form part of the curriculum in Arts required of medical students by our Universities, so that it is probable that all the higher grade of physicians will know something at least of the laws of reasoning.

One other subject must engage our attention. Schiller has truly said, "A physician whose horizon is bounded by an historical knowledge of the human machine, and who can only distinguish terminologically and locally the coarser wheels of this intellectual clockwork, may perhaps be idolized by the mob, but will never raise the Hippocratic art above the narrow sphere of a bread-earning craft."<sup>2</sup> The great extension of the domain of Physiology of late years by the empirical mode of inquiry—the microscope, chemical reagents, etc.,—has led our students to a too exclusive attention to what is perceptible to the senses. What the eye can see, the ear hear, the tongue taste, or the hand touch, is believed in; but there is a profound scepticism, or rather crass ignorance, in regard to powerful but hidden agencies which are continually at work. If we have trained our students to understand something of the laws of the physical world, or have at least given them that culture which will enable them to study these laws with advantage themselves, we must next teach them that the Somatic portion is not all man's nature, that there is a Psychical element of which he ought to know something: we must lead them to the boundary where physical observation terminates: but we must cross that boundary and conduct them into another domain (*μετα τα φυσικά*) where the study of mind asserts itself.

In the introductory remarks which I made on the various powers of the mind, I attempted to show that the knowledge of facts on which these powers act, was supplied either by Sensation and Perception, which gave the mind the information supplied by the senses, or by Consciousness which informs us of the operations

<sup>1</sup> *Op. cit.*, p. 27.

<sup>2</sup> Inaugural Dissertation on the connexion of the Animal Nature of Man with Intellectual. Quoted by Baron von Feuehtersleben.



of our mind. If, then, it is one object of general education to train us to the best means of comprehending and elucidating the phenomena of sense, it is another to make us comprehend the facts which have been ascertained, and the laws which have been discovered in regard to the manifestation of the phenomena of mind. But by the physician such a study is imperatively required. He has to do with matter and spirit united to form body and mind, and a very brief experience in his profession is sufficient to teach him how constantly the mind acts both etiologically and therapeutically on the body, and the body on the mind, and how essential it is that he should understand the operations of both.

The same arguments that support Logic apply to Metaphysics, and, as Professor Blackie observes,—“The prejudices of the vulgar English mind against metaphysics must not be allowed to infect our Universities.”<sup>1</sup> “Almost everything which has been contributed from these islands toward the advancement of psychology since Locke and Berkeley has, until very lately, and much of it even in the present generation, proceeded from Scottish authors and Scottish professors. Psychology, in truth, is simply the knowledge of the laws of human nature. . . . There are certain observed laws of our thoughts and of our feelings which rest upon experimental evidence, and, once seized, are a clue to the interpretation of much that we are conscious of in ourselves and observe in one another. Such, for example, are the laws of association. Psychology, so far as it consists of such laws,—I speak of the laws themselves, not of their disputed applications,—is as positive and certain a science as chemistry, and fit to be taught as such. . . . There is hardly to be found any discipline comparable to that which these metaphysical controversies afford,—for they are essentially questions about the estimation of evidence; about the ultimate grounds of belief; the conditions required to qualify our most familiar and intimate convictions, and the real meaning and import of words and phrases which we have used from infancy, as if we understood all about them, which are ever at the foundation of human language, yet of which no one except a metaphysician has rendered to himself any account.”<sup>2</sup>

To such testimony nothing can be added.

And now, in conclusion, I would merely observe, that it will become those who aspire to be true philosophers not to be deterred from following those methods of education, the value of which has been proved by experience, by Mr Lowe’s sneer, “I do not think you will find anywhere in the study of antiquity that which is in everybody’s mouth—the idea of progress.”<sup>3</sup>

No doubt, Progress is a watchword which has shaped the thoughts and efforts of multitudes, and which each and all of contending sects and parties in religion, in philosophy, and in politics have

<sup>1</sup> On Education, p. 35.

<sup>2</sup> Mill’s Inaugural Address, pp. 31 and 32.

<sup>3</sup> *Op. cit.*, p. 22.



claimed as their own. It is a rallying cry, too, which has an echo in every human heart oppressed with the sense of want and imperfection in every department of activity, and yearning for truth beyond what it has already obtained.

But that such a yearning may be satisfied,—if satisfied it ever can be in a world where perfect knowledge is unattainable,—we must not regard man's conquests over matter as the signs of his highest advancement. We may harness the steam to our chariot, and, like one of the genii of the Arabian Nights, make it our slave and bid it do our will; we may make the lightning our messenger, and flash our thoughts from continent to continent with an accuracy and rapidity, to which only the will, acting through the nerves of the animal body, seems a fitting comparison; we may bid the Sun be our artist, and instantaneously produce and record a copy of the image, dead or alive, presented to him.

All this shows us the superiority of man over matter, or rather the superiority of that spiritual force of which he is conscious in the depths of his personality,—a force which the eye cannot see nor the hand touch, which the scalpel of the anatomist cannot demonstrate, or the skill of the physiologist unravel, which has no local habitation even in the body which it inhabits and controls, but which makes itself known and asserts its dominion in the movements of the muscles which the will commands, in the pulsation of his heart which he cannot control, in each molecule of his tissue which it fills with its life.

The real progress is the progress of man intellectually, separated and isolated from all that lies outside of him; and such progress does not consist of the increase of one mental power to the prejudice or neglect of others. We must not regard the book of human knowledge as a ledger in which, by the "science of ponderation," we shall register each acquisition, and insert in the money-column after it its precise commercial value. The highest work of education is not the accumulation of facts, but the education of faculties, the discipline and development of intellect; and while intellect, so cultivated and refined, will ever be the best means of advancement in the acquisition of knowledge, and in its application to the business of life, it will satisfy every requirement of true progress; for while all that is material in us shall pass away, that which belongs to our immaterial nature, if well and wisely directed, will be quickened into new energies, and find at last, in another sphere of being, its aspirations after ideal perfection fully satisfied.

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